



- 1 (a) (i) In a camera magazine, 63 pages are used for adverts.  
The ratio number of pages of adverts : number of pages of reviews = 7:5 .

Calculate the number of pages used for reviews.

Answer(a)(i) ..... [2]

- (ii) In another copy of the magazine, 56 pages are used for reviews and for photographs.  
The ratio number of pages of reviews : number of pages of photographs = 9:5 .

Calculate the number of pages used for photographs.

Answer(a)(ii) ..... [2]

- (iii) One copy of the magazine costs \$4.90 .  
An annual subscription costs \$48.80 for 13 copies.

Calculate the percentage discount by having an annual subscription.

Answer(a)(iii) ..... % [3]

- (b) In a car magazine, 25% of the pages are used for selling second-hand cars,  $62\frac{1}{2}\%$  of the **remaining** pages are used for features, and the other 36 pages are used for reviews.

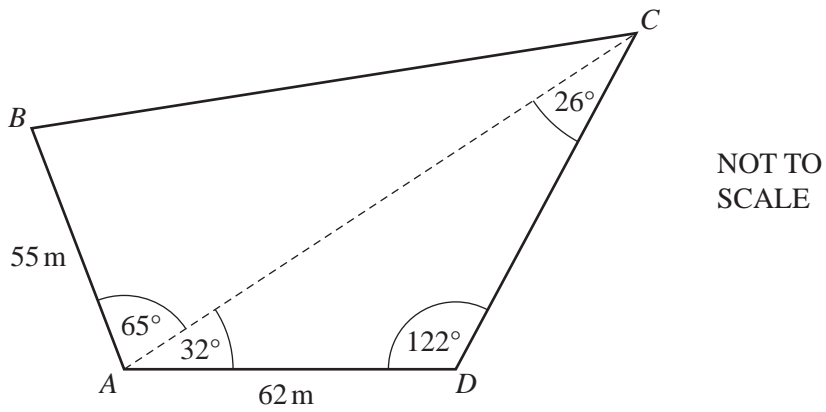
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Work out the total number of pages in the magazine.

*Answer(b)* ..... [4]

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- 2 A field,  $ABCD$ , is in the shape of a quadrilateral.  
A footpath crosses the field from  $A$  to  $C$ .



- (a) Use the sine rule to calculate the distance  $AC$  and show that it rounds to 119.9 m, correct to 1 decimal place.

*Answer(a)*

[3]

- (b) Calculate the length of  $BC$ .

*Answer(b)*  $BC = \dots\dots\dots$  m [4]

(c) Calculate the area of triangle  $ACD$ .

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*Answer(c)* .....  $\text{m}^2$  [2]

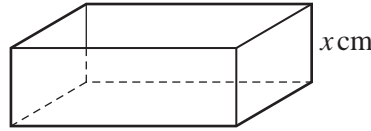
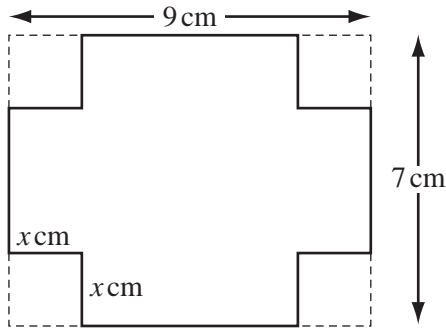
(d) The field is for sale at \$4.50 per square metre.

Calculate the cost of the field.

*Answer(d)* \$ ..... [3]

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- 3 A rectangular metal sheet measures 9 cm by 7 cm.  
A square, of side  $x$  cm, is cut from each corner.  
The metal is then folded to make an open box of height  $x$  cm.



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- (a) Write down, in terms of  $x$ , the length and width of the box.

Answer(a) Length = .....

Width = ..... [2]

- (b) Show that the volume,  $V$ , of the box is  $4x^3 - 32x^2 + 63x$ .

Answer(b)

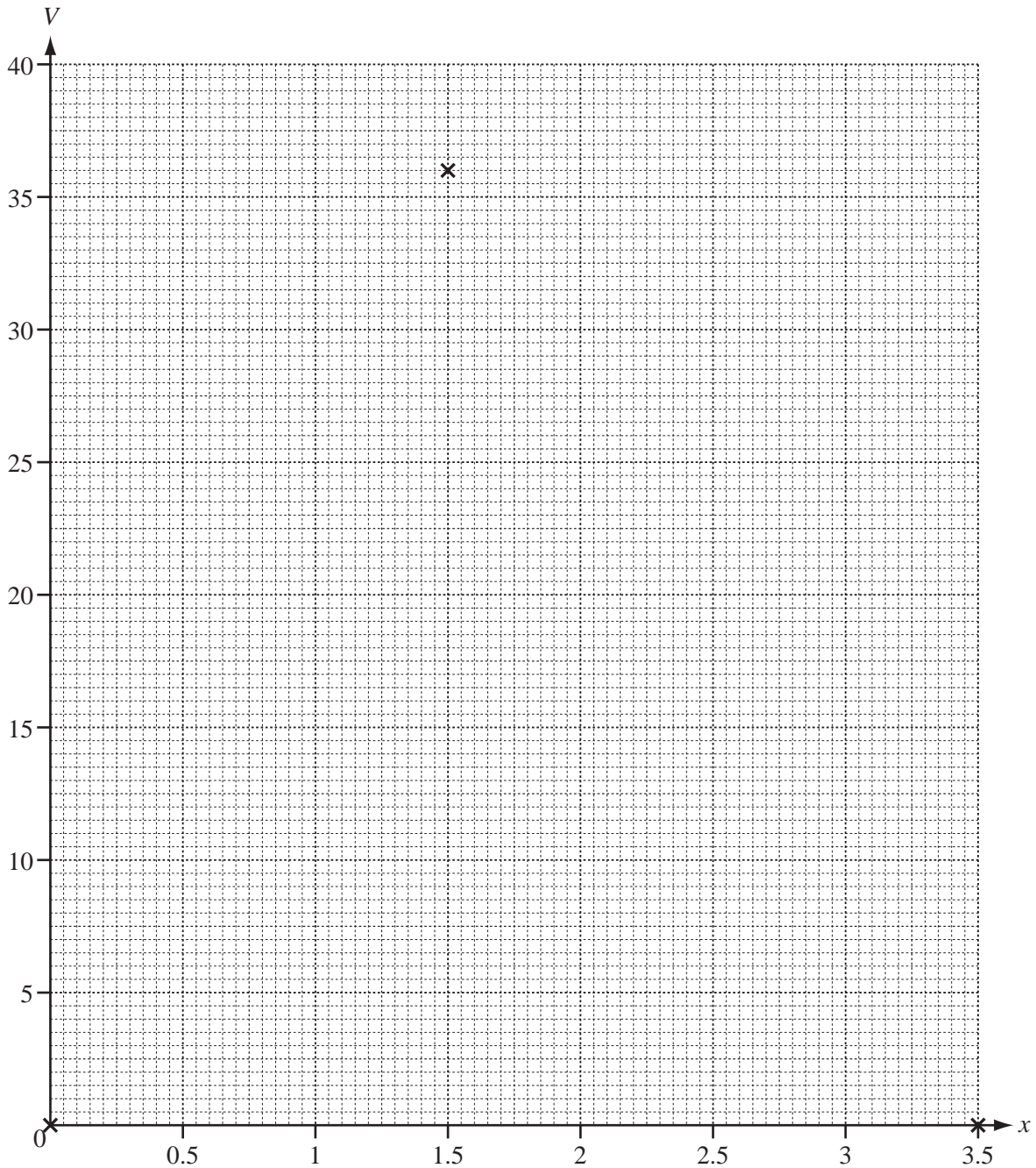
[2]

- (c) Complete this table of values for  $V = 4x^3 - 32x^2 + 63x$ .

$x$	0	0.5	1	1.5	2	2.5	3	3.5
$V$	0		35	36	30		9	0

[2]

- (d) On the grid opposite, draw the graph of  $V = 4x^3 - 32x^2 + 63x$  for  $0 \leq x \leq 3.5$ .  
Three of the points have been plotted for you.



[3]

- (e) The volume of the box is at least  $30\text{ cm}^3$ .  
Write down, as an inequality, the possible values of  $x$ .

Answer(e) ..... [2]

- (f) (i) Write down the maximum volume of the box.

Answer(f)(i) .....  $\text{cm}^3$  [1]

- (ii) Write down the value of  $x$  which gives the maximum volume.

Answer(f)(ii) ..... [1]

- 4 (a) One angle of an isosceles triangle is  $48^\circ$ .

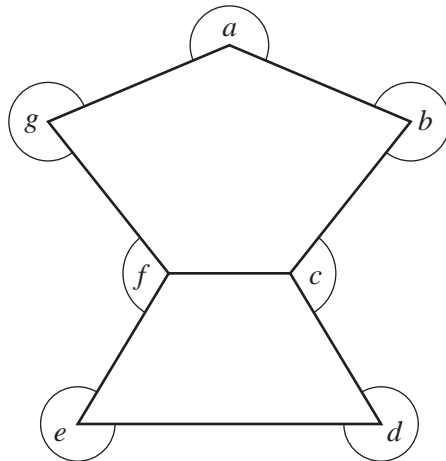
Write down the possible pairs of values for the remaining two angles.

Answer(a) ..... and .....  
..... and ..... [2]

- (b) Calculate the sum of the interior angles of a pentagon.

Answer(b) ..... [2]

- (c) Calculate the sum of the angles  $a, b, c, d, e, f$  and  $g$  shown in this diagram.

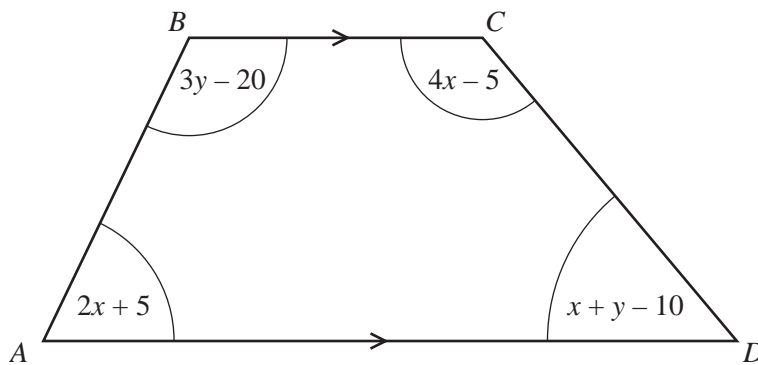


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Answer(c) ..... [2]



- (d) The trapezium,  $ABCD$ , has four angles as shown.  
All the angles are in degrees.



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- (i) Show that  $7x + 4y = 390$ .

*Answer(d)(i)*

[1]

- (ii) Show that  $2x + 3y = 195$ .

*Answer(d)(ii)*

[1]

- (iii) Solve these simultaneous equations.

*Answer(d)(iii)*  $x = \dots\dots\dots$

$y = \dots\dots\dots$  [4]

- (iv) Use your answer to **part (d)(iii)** to find the sizes of all four angles of the trapezium.

*Answer(d)(iv)*  $\dots\dots\dots$ ,  $\dots\dots\dots$ ,  $\dots\dots\dots$ ,  $\dots\dots\dots$  [1]

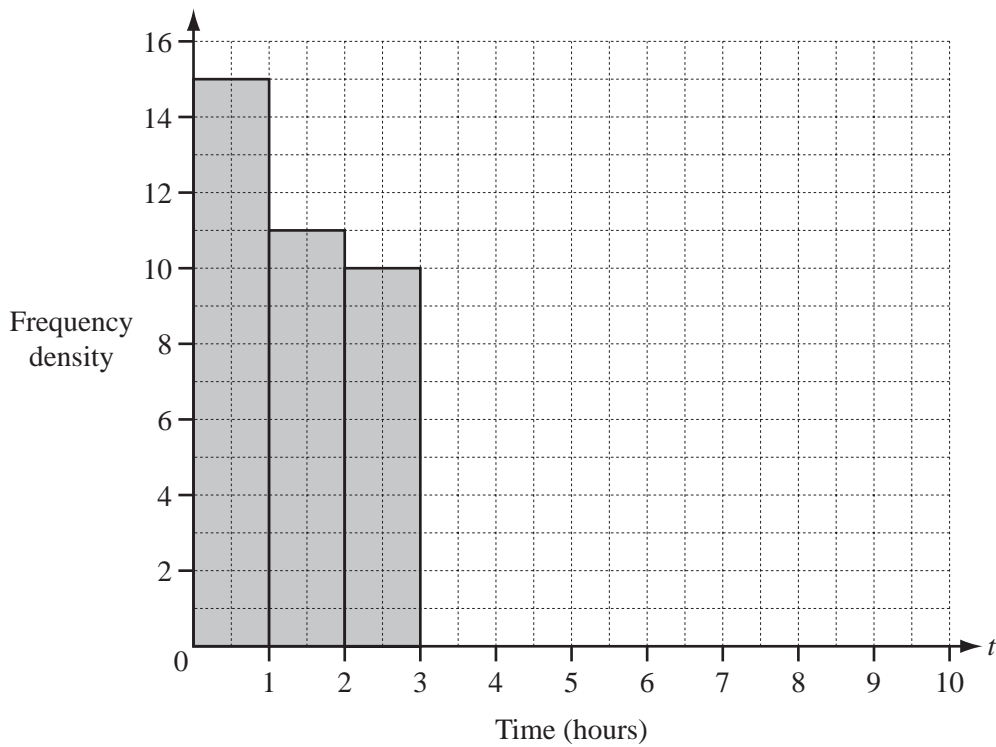
- 5 (a) 80 students were asked how much time they spent on the internet in one day.  
This table shows the results.

Time ( $t$ hours)	$0 < t \leq 1$	$1 < t \leq 2$	$2 < t \leq 3$	$3 < t \leq 5$	$5 < t \leq 7$	$7 < t \leq 10$
Number of students	15	11	10	19	13	12

- (i) Calculate an estimate of the mean time spent on the internet by the 80 students.

Answer(a)(i) ..... hours [4]

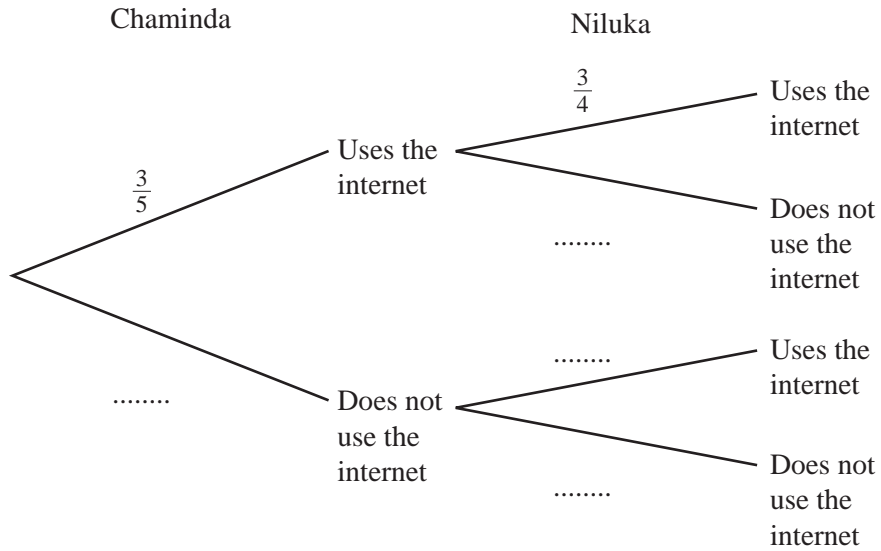
- (ii) On the grid, complete the histogram to show this information.



[4]

- (b) The probability that Chaminda uses the internet on any day is  $\frac{3}{5}$ .  
The probability that Niluka uses the internet on any day is  $\frac{3}{4}$ .

(i) Complete the tree diagram.



[2]

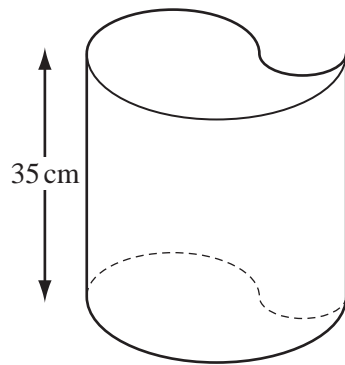
- (ii) Calculate the probability, that on any day, at least one of the two students uses the internet.

Answer(b)(ii) ..... [3]

- (iii) Calculate the probability that Chaminda uses the internet on three consecutive days.

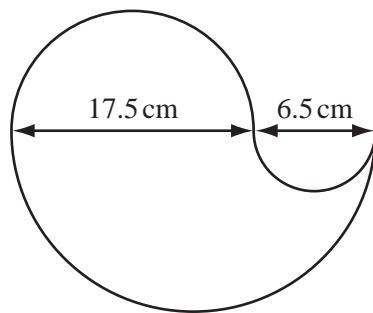
Answer(b)(iii) ..... [2]

- 6 Sandra has designed this open container.  
The height of the container is 35 cm.



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The cross section of the container is designed from three semi-circles with diameters 17.5 cm, 6.5 cm and 24 cm.



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- (a) Calculate the area of the cross section of the container.

Answer(a) ..... cm<sup>2</sup> [3]

- (b) Calculate the external surface area of the container, including the base.

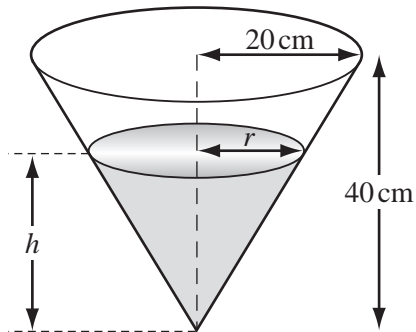
Answer(b) ..... cm<sup>2</sup> [4]

- (c) The container has a height of 35 cm.

Calculate the capacity of the container.  
Give your answer in litres.

Answer(c) ..... litres [3]

- (d) Sandra's container is completely filled with water.  
All the water is then poured into another container in the shape of a cone.  
The cone has radius 20 cm and height 40 cm.



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- (i) The diagram shows the water in the cone.

Show that  $r = \frac{h}{2}$ .

Answer(d)(i)

[1]

- (ii) Find the height,  $h$ , of the water in the cone.

[The volume,  $V$ , of a cone with radius  $r$  and height  $h$  is  $V = \frac{1}{3}\pi r^2 h$ .]

Answer(d)(ii)  $h =$  ..... cm [3]

7 (a) The co-ordinates of  $P$  are  $(-4, -4)$  and the co-ordinates of  $Q$  are  $(8, 14)$ .

(i) Find the gradient of the line  $PQ$ .

Answer(a)(i) ..... [2]

(ii) Find the equation of the line  $PQ$ .

Answer(a)(ii) ..... [2]

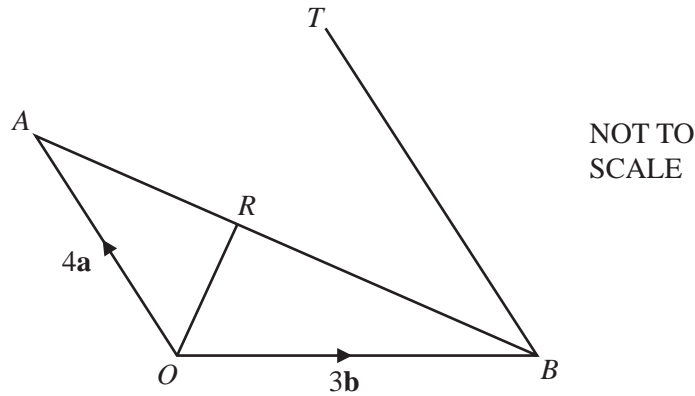
(iii) Write  $\vec{PQ}$  as a column vector.

Answer(a)(iii)  $\vec{PQ} = \begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

(iv) Find the magnitude of  $\vec{PQ}$ .

Answer(a)(iv) ..... [2]

(b)



In the diagram,  $\vec{OA} = 4\mathbf{a}$  and  $\vec{OB} = 3\mathbf{b}$ .

$R$  lies on  $AB$  such that  $\vec{OR} = \frac{1}{5}(12\mathbf{a} + 6\mathbf{b})$ .

$T$  is the point such that  $\vec{BT} = \frac{3}{2}\vec{OA}$ .

(i) Find the following in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , giving each answer in its simplest form.

(a)  $\vec{AB}$

Answer(b)(i)(a)  $\vec{AB} = \dots\dots\dots$  [1]

(b)  $\vec{AR}$

Answer(b)(i)(b)  $\vec{AR} = \dots\dots\dots$  [2]

(c)  $\vec{OT}$

Answer(b)(i)(c)  $\vec{OT} = \dots\dots\dots$  [1]

(ii) Complete the following statement.

The points  $O$ ,  $R$  and  $T$  are in a straight line because  $\dots\dots\dots$   
 $\dots\dots\dots$  [1]

(iii) Triangle  $OAR$  and triangle  $TBR$  are similar.

Find the value of  $\frac{\text{area of triangle } TBR}{\text{area of triangle } OAR}$ .

Answer(b)(iii)  $\dots\dots\dots$  [2]

- 8 (a) Rearrange  $s = ut + \frac{1}{2}at^2$  to make  $a$  the subject.

Answer(a)  $a = \dots\dots\dots$  [3]

- (b) The formula  $v = u + at$  can be used to calculate the speed,  $v$ , of a car.

$u = 15$ ,  $a = 2$  and  $t = 8$ , each correct to the nearest integer.

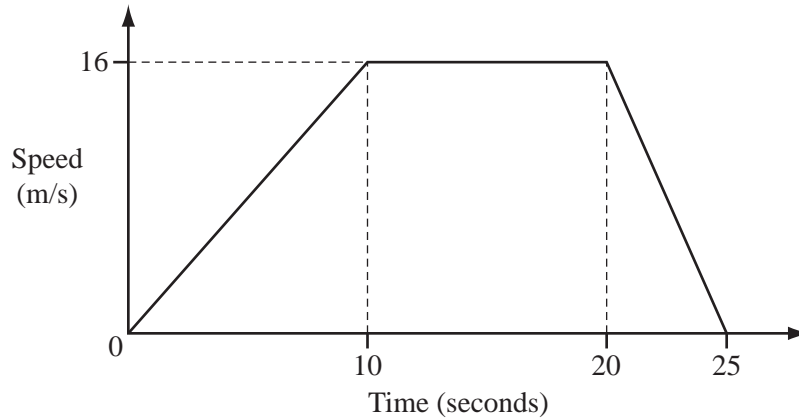
Calculate the upper bound of the speed  $v$ .

Answer(b)  $\dots\dots\dots$  [3]



(c) The diagram shows the speed-time graph for a car travelling between two sets of traffic lights.

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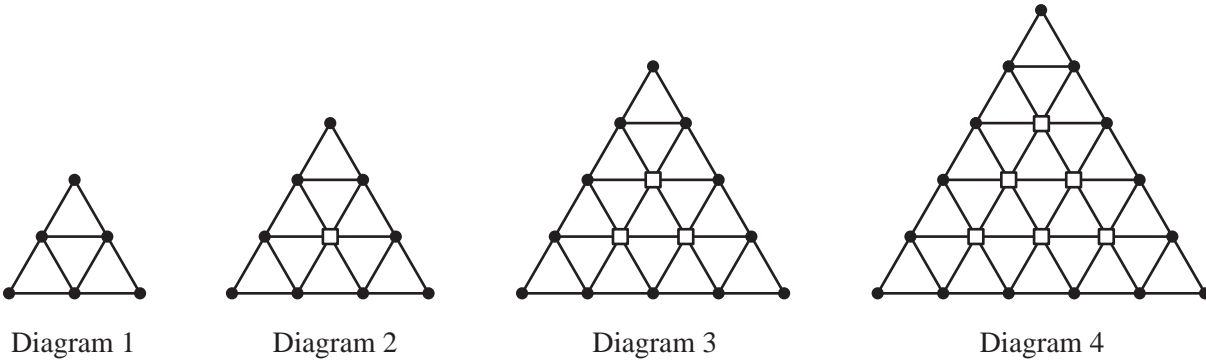
(i) Calculate the deceleration of the car for the last 5 seconds of the journey.

*Answer(c)(i)* .....  $\text{m/s}^2$  [1]

(ii) Calculate the average speed of the car between the two sets of traffic lights.

*Answer(c)(ii)* .....  $\text{m/s}$  [4]

9 The first four diagrams in a sequence are shown below.



The diagrams are made from dots (●) and squares (□) joined by lines.

(a) Complete the table.

Diagram	1	2	3	4	5		$n$
Number of dots	6	9	12				
Number of squares	0	1	3				$\frac{1}{2}n(n - 1)$
Number of triangles	4	9	16				
Number of lines	9	18	30	45	63		$\frac{3}{2}(n + 1)(n + 2)$

[9]

(b) Which diagram has 360 lines?

Answer(b) ..... [2]

(c) The **total** number of lines in the first  $n$  diagrams is

$$\frac{1}{2}n^3 + pn^2 + qn.$$

(i) When  $n = 1$ , show that  $p + q = 8\frac{1}{2}$ .

*Answer(c)(i)*

[1]

(ii) By choosing another value of  $n$  and using the equation in **part (c)(i)**, find the values of  $p$  and  $q$ .

*Answer(c)(ii)*  $p = \dots\dots\dots$

$q = \dots\dots\dots$  [5]

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**Question 10 is printed on the next page.**

10 (a) Simplify.

$$\frac{x^2 - 3x}{x^2 - 9}$$

Answer(a) ..... [3]

(b) Solve.

$$\frac{15}{x} - \frac{20}{x+1} = 2$$

Answer(b)  $x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [7]

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